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Ultrasound in Fibroadenoma- Our Experience with the Most Common Modality Used in a Most Frequent Breast Condition

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Abstract:
Background: Breast lumps are a frequent occurrence in women of reproductive age, of which fibroadenomas are the most common. Ultrasound and mammography are the two most frequent imaging modalities for their detection and evaluation. Both are popular and they have their own merits and demerits. The aim of this study was to correlate ultrasound and mammographic findings in histopathologically confirmed cases of fibroadenoma and to evaluate the value of resistive index (RI) derived on ultrasound in the evaluation of fibroadenoma.
Material and Methods: This is a prospective study over a period of 18 months. All patients with a palpable solid breast mass were initially registered. From this database all cases that were confirmed as fibroadenoma on histo-pathology and had evaluation both by mammography and ultrasound were included for the analysis. The Resistive Index (RI) was estimated in all those who had increased vascularity.
Results: Of the total 39 cases included maximum number was in age group of 40-50 years (mean 43 ±6.5years). Majority were multiple measuring less than 3 centimeters and hypo echoic. Twenty (51%) were confined to the upper outer quadrant. Thirty-nine (79%) were vascular of which 1/3 had > 3 vessels visualized.
Conclusions: Most cases are diagnosed on mammography, but ultrasound scored over it, in study of fibroadenomas in the dense breasts. By using RI with a cut-off of 0.7, one can differentiate benign from malignant lesion among the fibroadenomas.
Keywords*: Breast-masses, Color-Doppler, Benign tumours, Resistive index*

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I. Introduction

Breast lumps are most common complaint of young females. The most common benign breast mass is Fibroadenoma (FA). They are nothing but, over-growth of normal breast tissue that develop due to the hormonal effects, commonly seen in young women. These masses may be single or multiple and are painless, soft, and mobile. Peak incidence is in 3rd decade and account for 68% of all breast masses[1]. They may increase in size during adolescence, lactation and pregnancy. After menopause, they undergo atrophy; rarely there may be malignant change. Mammography is a screening tool for breast cancer detection. Ultrasonography is the modality for initial evaluation of mass in young females. The role of ultrasound in evaluation of the breast masses is increasingly realized and high-lighted in several studies[,2,3].Somestudieslikethose by Del Cura et al and Daniela et al correlated RI with histopathological changes and found that it could differentiate the benign from the malignant lesions with high accuracy[4,5]. According to Del Cura, mean RI value was 0.82 for malignant lesion and 0.65 for benignmasses[4].In view of paucity of literature on the utility of RI in evaluation of fibroadenomas, we had undertaken this study. This study was aimed to correlate ultrasound and mammographic findings in histopathologically confirmed cases of fibroadenoma and to evaluate the value of resistive index (RI) derived on ultrasound in the evaluation of fibroadenoma.

II. Material and Methods

This study was conducted in Department of Radiology and Imageology, Nizam's Institute of Medical Sciences, Hyderabad. This was a study over a period of 18 months [November 2017 to April

2019] conducted after obtaining approval from the Institutional Ethics Committee. All patients aged more than 18 years with solid palpable breast lumps were initially included in the database. All those with a diagnosis of fibroadenoma on histopathology, both mammography and ultrasound examination were carried out if not done recently. The cystic lesions and those with unclear histopathological diagnosis were excluded. The ultrasound examination was done on Esaote MyLab with probe 3-12 MHz All mammographic studies were done using Lilyum BYM at 200 MAS 20-25 KVP-in Craniocaudal and Mediolateral oblique views. Written informed consent of the patients was taken for their inclusion in the study. The tumor-margins, shape, lobulation, posterior shadowing, Spongy appearance and calcification are studied specifically in each mass. The images in this manuscript were utilized in this study after due permission from the Ethics Committee.

The standard statistical methods were used for calculation of average, mean and standard deviation. Analysis was performed using Chi-square test, SPSS 21.0 statistical analysis program was used for this analysis. $P \leq 0.05$ was taken to indicate significant.

III. Observations

The total cases included and analyzed were 39 after the exclusions. Maximum number was in age group of 40-50 years (mean age was 43 ±6.5years) (Table-1). There was a single case less than 30years and one case morethan65years.Therewere2casesassociatedwithcarcinoma.The masses were distributed in upper outer, lower outer, upper inner and lower inner quadrants in 20, 7, 6, and 6 cases respectively. Thirteen of the 20 cases in the outer upper quadrant were in the right breast. Most of fibroadenomas are multiple, hypoechoic, <3cminsize(average size – 1.85 X 1.1 cm) and showed minimal vascularity and RI value <0.7(Tables-2 and 3).The mean size of the masses was greatest in the outer upper quadrant. Most of the Fibroadenomas showedsmoothmargins.17.9%of cases showed calcification and 10% cases are not visible on mammography. Macro-lobulation was seen in 19(48.7 %) out of total 39 cases. The echogenicity was hypo in 36 and mixed-echoic in 3 cases. BIRAD category was II in 35, III in 2 and IV in 2.

IV. Discussion

On mammography, the Fibroadenoma appear as well defined, rounded, oval mass (Fig-1). USG not only differentiates solid from cystic space-occupying lesion but also it is the choice method in dense breasts. On ultra-sonography (USG) they present as homogenous masses which are well defined, hypoechoic, and oval, wider than tall with or without posterior acoustic enhancement (Fig-2). The calcification in fibroadenoma is usually of coarse variety and show posterior shadowing. Most (80%) of FA showed high vascularity; more so in younger patients than older due to higher incidence of sclerosed fibroadenoma in the later (Fig-3). Feeding vessel is identified as the prominent vessel extending from breast tissue to fibroadenoma; capsular vessels are seen at periphery and the segmental vessels along septae (Fig-4).

Our study included a total of 3 9cases with maximum in age group of 40-50years.There was a single case of less than 30 and another patient more than 60-year-old. Though the reported peak incidence of FA is 30years, our patients were in maximum number in the elderly age group. This may be due to the cases being included after having all three-mammogram, USG and HPE. 21 of the 39 showed multiple lesions. In a study by Ibrahim R etal30%weresingleand70%were multiple. Williamson ME and Lyons K et al observed that fibroadenomas can be multicentric in nearly 15% cases[6]. We had 54% with multiple masses. Two cases of fibroadenoma were associated with Intra-ductal carcinoma (IDC) and phyllodes. Buzanowski et al could find only 5 cases of lobular carcinoma in situ in a large series of 4000 cases of fibroadenomas[7].Vascularity of FA was shown to be variable in different studies. Out of 39 cases of fibroadenomas in our series, 20.5% of cases are avascular, 51% had minimal vascularity (<3vessels) and 28% of showed high vascularity (>3 vessels)(Fig-5).According to Svensson et al[8] 46% of benign lesions showed vascularity. In a study done by Kanika Gupta e tal[9] 62% of fibroadenomas were avascular. This variable data may be due to more vascularity in younger patients and the vascularity getting reduced due to age-related involution of mass[10]. Vessels may be seen at capsule, along septae/segmental or as feeding vessels from surrounding parenchyma. In our series 21 of 31 cases (67.7%) had RI<0.7andonly8% are above it (Fig-6). Rest of the masses were avascular. According to Peters- Engl et al[11]RI of 0.7 is the best cut off value for differentiating benign from malignant lesion. Del Cura et al correlated RI and PI with high sensitivity. According to their study mean RI value was 0.82 for malignant lesion and0.65 for benignmasses[4].In our observation, 50% of the fibroadenomas were found in upper outer quadrant. Most of the fibroadenomas showed smooth margins.17.9%of cases showed calcification and 10% cases are not visible on mammography(Fig-7).According to Alireza Namazi et al FA was situated in upper outer quadrant in right and left breast in 64.5%, 57.4% of cases respectively. 57.8% were having smooth margins and 2.2% had calcification[2](Fig-3). Gharekhanloo et al showed that mammographies were negative in 14.3% due to high density of breast parenchyma; this is like our observation[12].10%cases were

not identified on mammogram but could be well appreciated/diagnosed on ultrasound (Fig-7, 8). Rest were identified on mammography as well-defined dense oval/rounded masses mostly less than 3cms size (Fig-9). Frequency of malignancy in fibroadenoma is rare. Incidence is 1 in 1000 with increased risk related to complex FA and more so with in-situ carcinoma as in our case (Fig-10). Infiltrating ductal carcinoma is veryrare[13].

LIMITATIONS

The number included were only 39 which is an important limitation. The ultrasound being an observer dependent investigation it could have an inherent limitation in assessment, as multiple operators were involved. We suggest a larger study based on these observations.

V. Conclusion

Fibroadenomas constituted the most common benign breast masses. Most of them are diagnosed on mammography but USG is helpful in detecting them in the dense breasts. On USG most of these lesions are well defined, hypoechoic, less than 3cms with variable vascularity. RI is useful to differentiate benign from malignant lesion using a cut-off of 0.7.

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TABLES/FIGURES

Table-1: Diagram showing age distribution of fibroadenoma

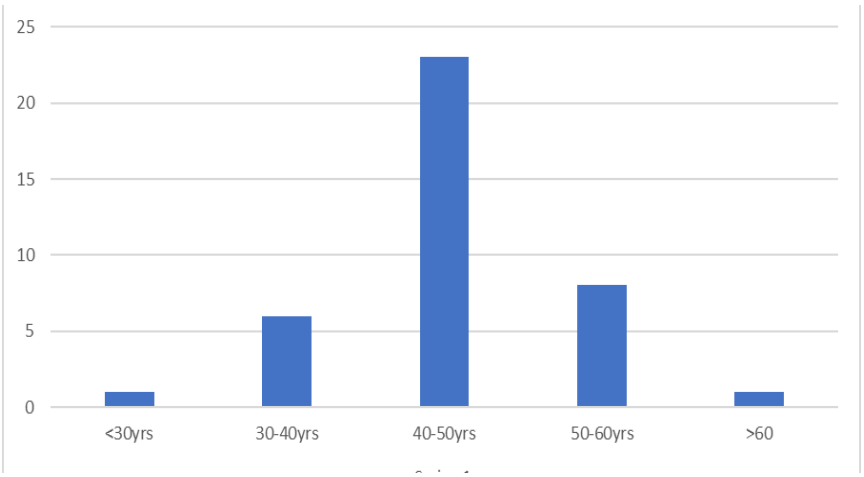


TABLE-2 is showing the USG characteristics of 39 cases of Fibroadenomas

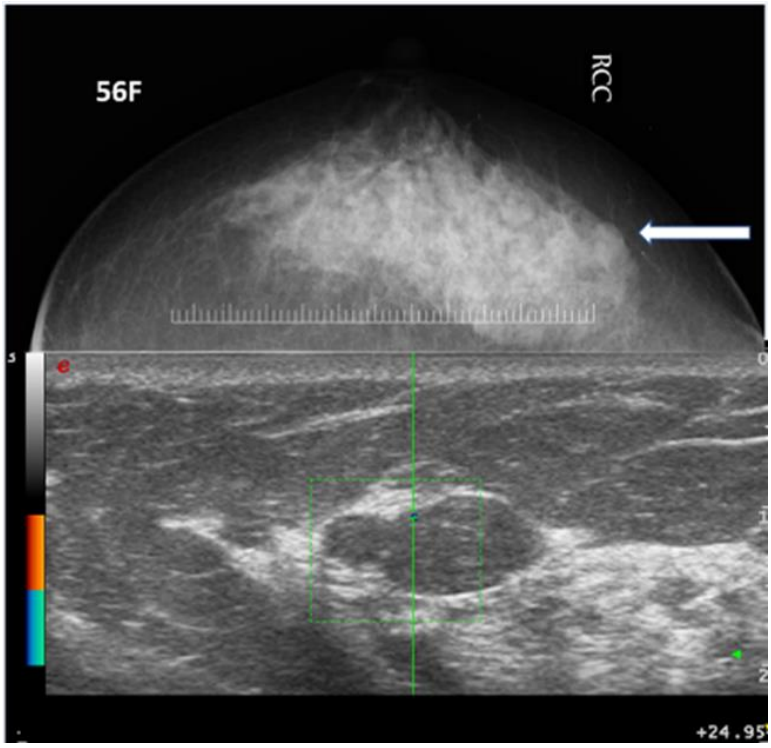
CHARACTERISTIC of FIBROADENOMAS		NO. OF CASES	PERCENTAGE
Number	single	18	46
	multiple	21	54
Size	<3cm	37	94.8
	>3cm	2	5.2
Echogenicity	hyper	-	0
	hypo	36	92.3
	hetero	3	7.7
Vascularity	absent	8	20.5
	Minimal (<3 vessels)	20	51.2
	More (>3 vessels)	11	28.2
RI value	<0.7	27	54
	≥0.7	4	8

Table 3: Showing Mammographic Features of Fibroadenomas (Total n= 39 Cases).

Fibroadenomas		No. of cases	Percentage
Site	Upper outer quadrant	20	50%
	Lower outer quadrant	7	18%
	Upper inner quadrant	6	16%
	Lower inner quadrant	5	14%
	Retro-areolar area	1	2%
Size	<3cm	33	84.6%
	>3cm	2	5%
Density	hyper	35	90%
	Lucent	-	-
	Mixed	-	-
Smooth margins Lobulated margins		35 -	89.6%
calcifications		7	17.9%
Not visible on mammography		4	10%

Figures

Figure-1:



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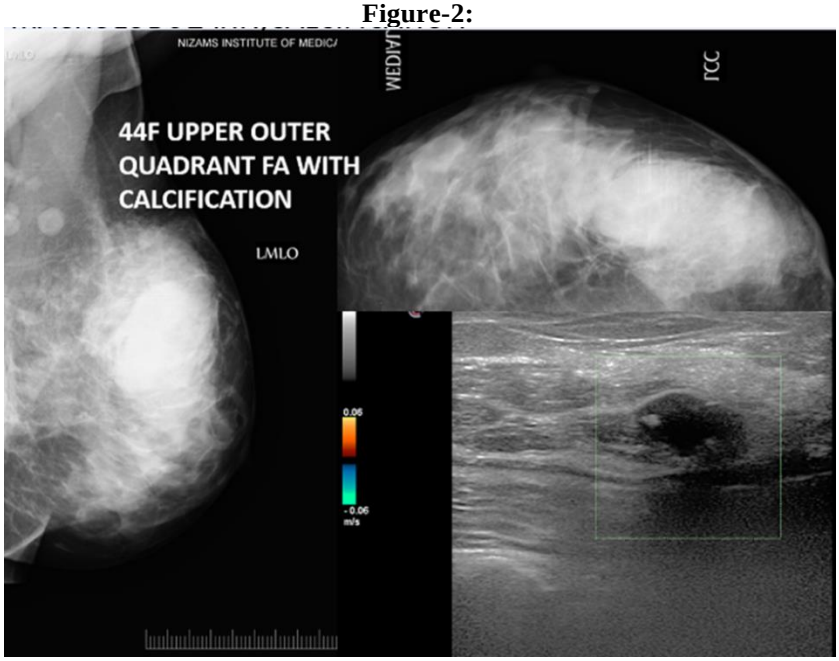

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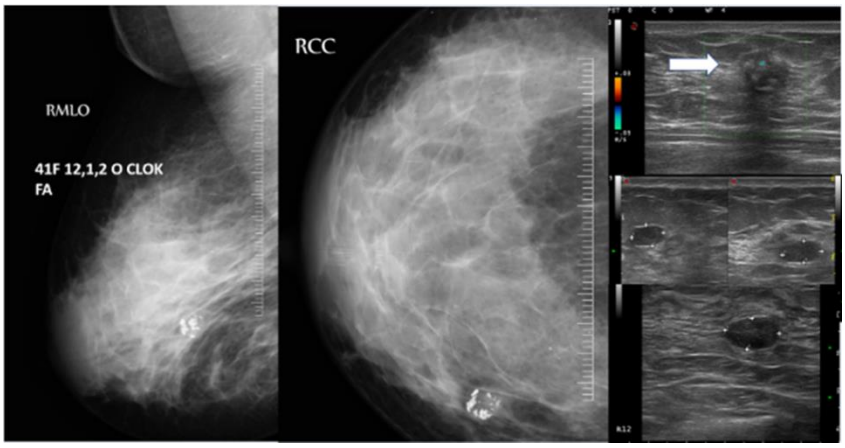

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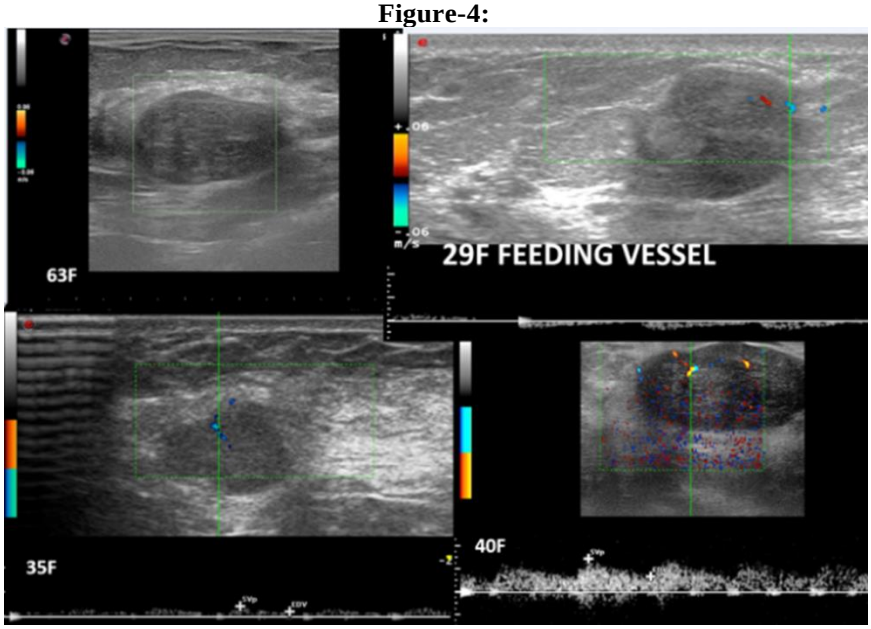

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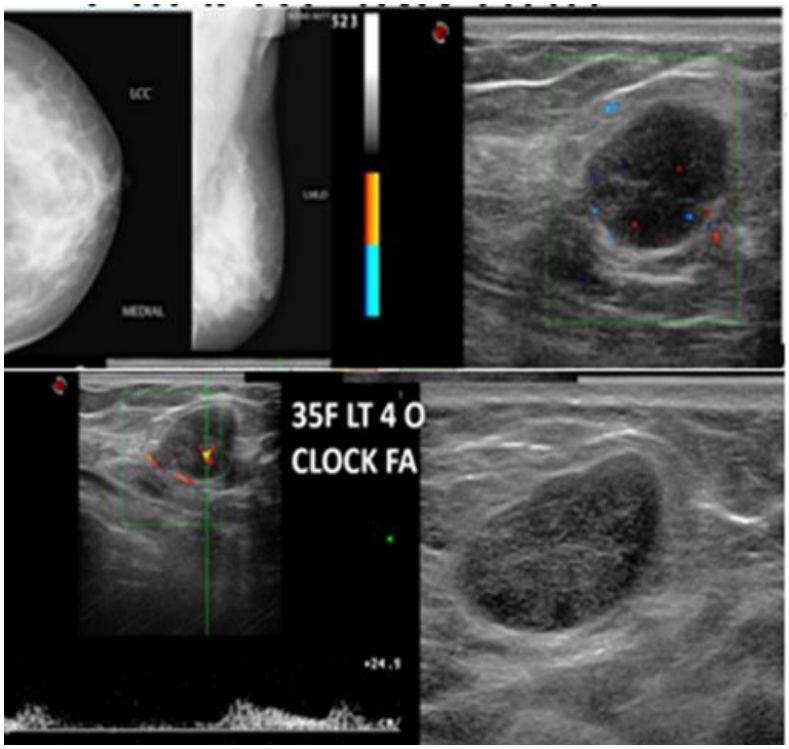

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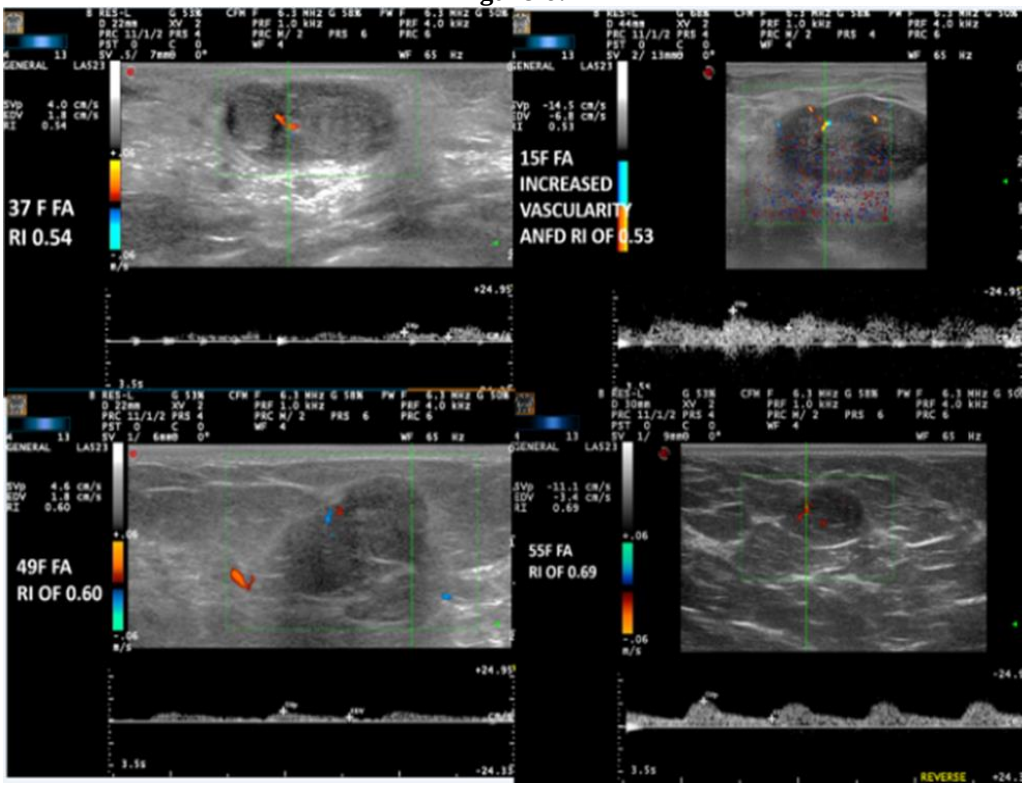
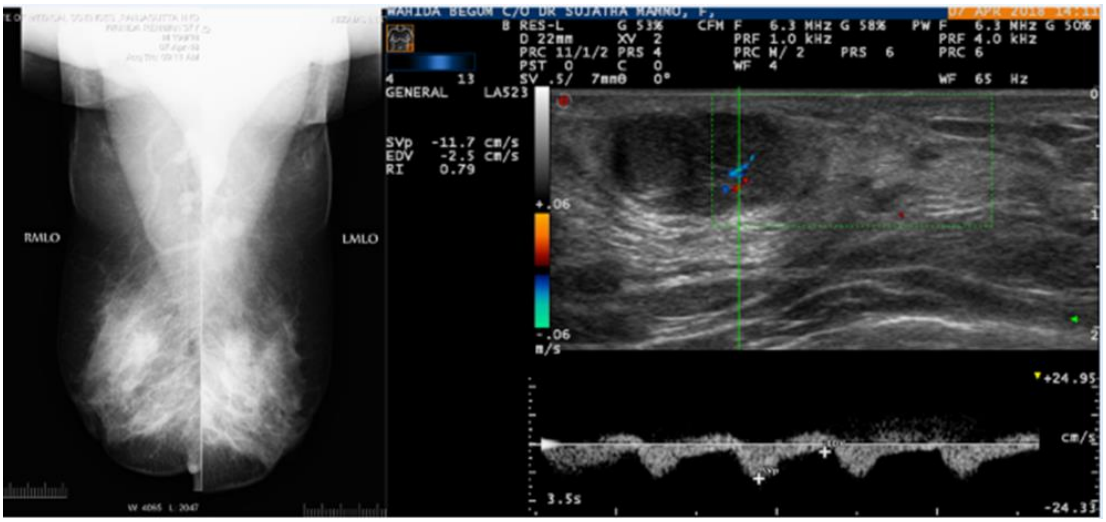


Figure-7



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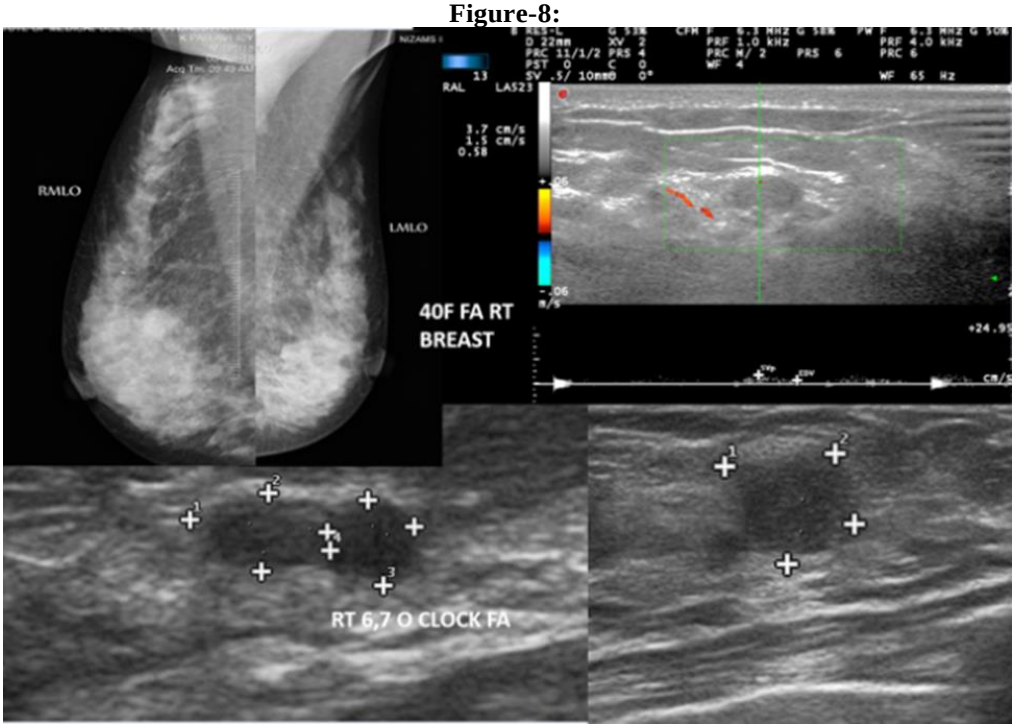

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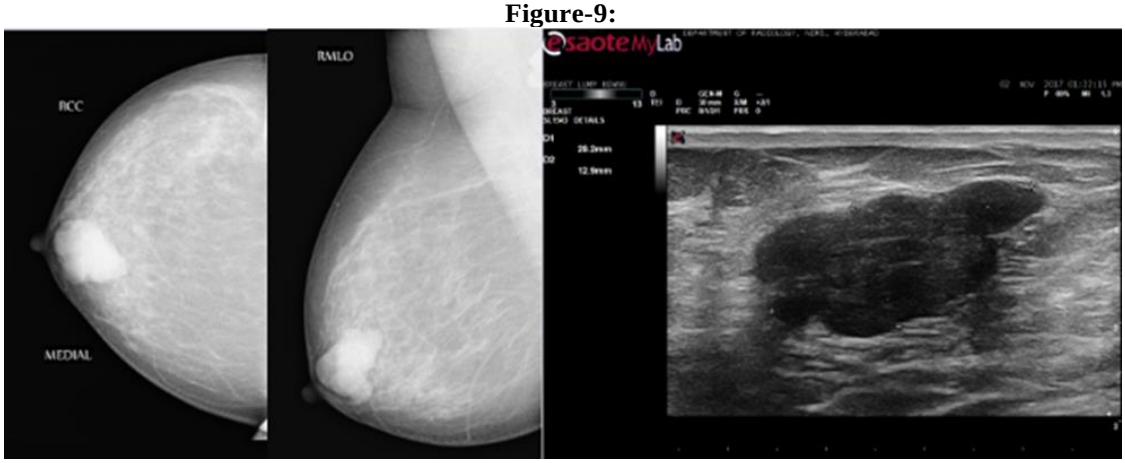

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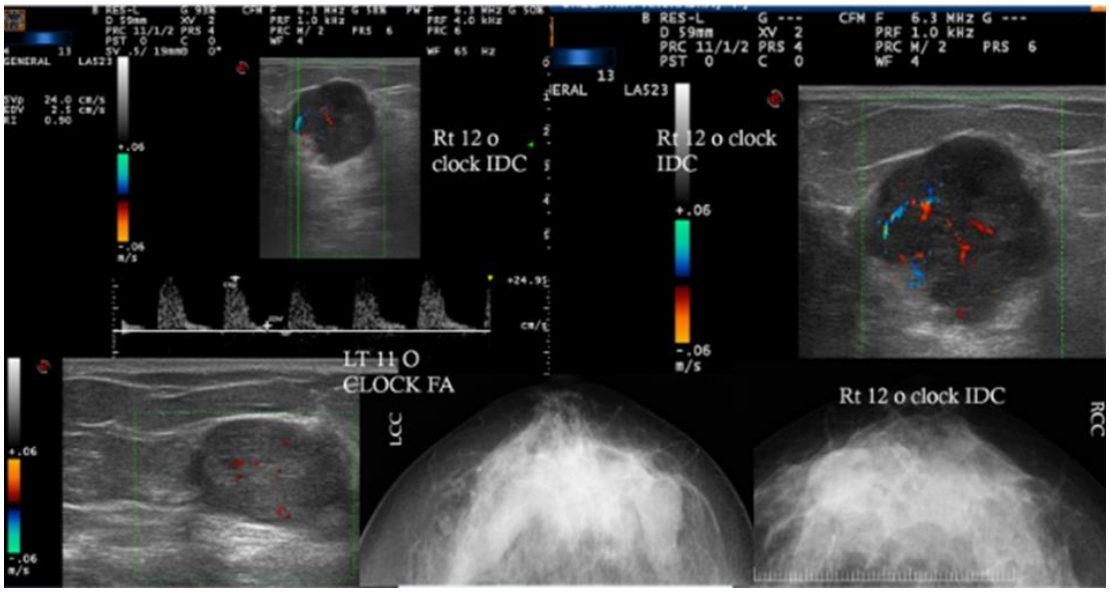

LEGENDS

Figure-1: In an HPE proven case of FA, USG shows low vascularity; capsular vessel is shown on mammography; lesion is dense well defined at 100 clock position
Figure-2: Well-defined FA (HPE proven), on mammography; On USG well-defined hypo-echoic, transversely oval mass with posterior enhancement and macro-lobulation; calcification
Figure-3: HPE proven Calcified FA at 1oClock position with neo-vascularity
Figure-4: Different cases of HPE proven FAs, showing neo-vascularity, feeding vessel, capsular vessels and segmental vessels
Figure-5: This HPE proven FA, shows increased vascularity; this lesion was not appreciated on mammography
Figure-6: RI measured in 4 different cases of FA (all HPE proven)
Figure-7: 37F, FA (HPE proven) in left upper outer quadrant; Not appreciated on mammography; On USG it is well-seen with internal vascularity and increased RI of 0.79
Figure-8: This HPE proven FA is well seen on USG as compared to mammogram in dense breasts
Figure-9: 41F, FA (HPE proven); lobulated dense opacity: On USG-lobulated hypoechoic mass
Figure-10: 37F, FA (HPE proven) in left breast and IDC in right breast; Increased vascularity and raised RI of carcinoma

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